Decommissioning Plan

Muskogee, Oklahoma Facility
U.S. Nuclear Regulatory Commission
License No. SMB-911

Kirkpatrick & Lockhart
Pittsburgh, Pennsylvania

Project No. P0111
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Earth Sciences Consultants, Inc.

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other general plant areas, adjacent ground surface, the wastewater treatment plant facility, and the wastewater treatment ponds and associated structures.

A limited amount of isotopic analysis has been performed on the material at the Fansteel site. The available information indicates that uranium and thorium and their daughter products are present in the process residues and in contaminated soils and other materials. The quantitative results show that radioactive equilibrium exists in both the thorium and uranium decay sequences at least to the alpha-emitting isotopes of radium; i.e., Ra^{226} and Ra^{224}. Isotopes farther down the decay sequences for uranium and thorium have not been determined as of the date of this document. However, the available information supports the contention that a condition approximating radioactive equilibrium exists at the site. Additional information on the details of isotopic distribution at the site will be obtained during the course of the decommissioning activity.

Respectfully submitted,

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Soils will be decontaminated or disposed of such that the residual level of activity above background is no greater than 10 picocuries per gram due to any combination of uranium Isotopes 238 and 234 and thorium Isotopes 232 and 228 as specified in the Branch Technical Position dated October 23, 1981 (46 FR 52061). This decontamination limit presupposes demonstration of a condition of radioactive equilibrium between each of the parent radionuclides and their decay daughters. This limit will also apply to any other nonsoil solid material that will be left in or on the ground at the site.

Upon completion of decommissioning, groundwater will contain no more radionuclides than would be acceptable under the current drinking water limitations, 40 CFR 141.64. If this standard cannot be achieved, Fansteel will undertake to perform a drinking water pathway dose assessment for the specific radionuclides found to be present as a result of monitoring activities carried out in performance of the Remedial Assessment and Decommissioning Plan work activities.

2.1.2 Decommissioning Tasks

The decommissioning operation has been divided into the following major task areas. Many of these activities can be performed simultaneously. The project tasks are as follows:

- Initial site radiation survey.
- Decontaminate process equipment that will be shipped off site.
- Ship process equipment to receiving facility.
- Decontaminate building and facility surfaces.
- Remove and package as waste any materials that cannot or will not be decontaminated.
- Remove, treat, and package process materials for shipment off site.
- Remove, decontaminate, and package pond liner material for waste disposal.
- Remove and package contaminated soils and other nonrecyclable solid material for waste disposal.

- Dispose of radioactive waste.
- Conduct decommissioning radiation survey.
- Adjust site contours for positive drainage compatible with surrounding areas.

The specific activities that will take place in order to accomplish these tasks are presented in the following sections.

2.1.2.1 Initial Radiation Survey

The initial radiation survey will look at the entire plant property. Samples will be obtained of soils, process materials, subsurface materials, air, groundwater, and surface water. Instrument surveys will be made of building surfaces, processing equipment, building facilities, etc. Wipe samples will be obtained from areas showing in excess of 200 disintegrations per minute to check for removable radioactivity.

The environmental radiation survey (i.e., soil, air, water, and process materials) will be conducted in the context of an overall site remediation assessment that is being conducted by Earth Sciences Consultants, Inc. (Earth Sciences) for Fansteel. The work plan for the site assessment has already been submitted to the NRC for review, comment, and approval. This remedial assessment contains a soil survey and sampling plan that addresses the delineation of contaminated or affected areas, as well as the determination of background radioactivity at and near the site. This survey and sampling plan is summarized in the following materials. However, the remedial assessment work plan document is incorporated by references.

Determination of the applicable level of background radioactivity involves both an instrumental survey and acquisition and analysis of soil samples, followed by rigorous data analysis. The definition of background conditions will meet the statistical requirements found in Monitoring for Compliance with Decommissioning Termination Survey Criteria, ORNL, NUREG/CR-2082, U.S. Nuclear Regulatory Commission, June 1981 (NUREG/CR-2082), as it relates to determination of background conditions.

In the case of soils, external radiation measurements will be obtained at a number of locations outside buildings, structures, and facilities. A survey grid will be established utilizing a ten meter spacing within the remediation assessment study areas. These areas are identified in the accompanying Remedial Assessment Work Plan and are areas of land within the property boundaries that are considered likely to have been affected by manufacturing operations based on knowledge of the operating history of the facility. Outside the remediation assessment study areas is a substantial area of land owned by the licensee which is not believed to have been so affected. This area of land will initially be surveyed utilizing a grid based on a twenty five meter spacing.

Ambient radioactivity will be measured using a Ludlum 44-10 gamma scintillation detector and a Ludlum Model 44-7 or 44-21 beta/gamma detector. Each grid intersection will be measured at two locations. The Ludlum Model 44-10 scintillation detector will be used to obtain a measurement within 1 centimeter of the ground surface and a second measurement at a height of 1 meter above the ground surface. A Ludlum Model 44-7 or 44-21 beta/gamma detector will also be used to obtain a radiation measurement at each grid intersection within 1 centimeter of the ground surface.

The background radiochemical characteristics of the general area will be determined by a program of off-site sampling and instrumental measurements. Several external factors contribute complications to the choice of sampling and measurement locations. The first of these factors is the presence of the Arkansas River. In the case of a mature river such as this one, one bank will typically be characterized by net erosion and loss of material downstream, the other bank by deposition and net gain of material from upstream. While these processes are inherently dynamic, they may be considered static for purposes of determination of the radiological impact of the Fansteel facility over its operational life. In order to retain comparability, all background samples and measurements will be obtained from the same side of the river as the Fansteel operation.

Other complicating factors include the extent of industrial development in the immediate surroundings. This development, including the presence of a large electrical generating plant as well as other manufacturing and transportation

facilities, may have resulted in the placement of dredged fill and other exogenous material on the land surface and the deposition of contaminants including possible trace amounts of radioactive materials. Background sample locations will be chosen with a deliberate attempt to avoid distinct areas of fill material or areas visibly affected by other industrial activity.

Within these constraints, a minimum of ten off-site sample locations will be chosen to determine background radioactivity conditions. Each background location will be measured for gamma radiation field strength within 1 centimeter of the surface and at a height of 1 meter above the ground surface. Beta/gamma measurements will also be obtained from each location within 1 centimeter of the ground surface.

A surface soil sample will be obtained at each off-site background location. These samples will be representative of the top 6 inches of earth materials. Each sample will be analyzed for gross alpha, gross beta, uranium (Isotopes 234 and 238), thorium (Isotopes 228 and 232), and radium (Isotopes 226 and 228). These samples will be considered representative of the radiological background conditions for purposes of comparing conditions found on the Fansteel site. Undisturbed soils or other earth materials will be presumed to be in a state of radioactive equilibrium if these isotopes are present at equilibrium activities.

After the instrument survey of the site has been completed, the data will be examined to determine if the predetermined operational boundaries of the study areas are appropriate for decommissioning purposes. Additional instrument readings may be obtained to further delineate areas exhibiting elevated radiation responses. The area determined to lie outside the study areas will then be sampled to determine background gross alpha and beta activity in site soil. Soil samples will be collected off the top 6 inches of material from at least 20 randomly selected grid intersections. A random number generation technique will be used to select sample sites for this operation.

These surface soil samples will be submitted for laboratory determination of gross alpha and beta activity. Analytical results will be examined for statistical consistency and conformance with the off-site background mean value for gross

activity. Any samples that show significantly higher activity than the calculated mean of the off-site background samples will be further analyzed to determine the specific isotopes responsible for the observed elevated activity. The single tailed value of Student's "t" at the 90 percent confidence level will be used as the test for significance. This is a generous estimator of significance so it will not be used to test for outliers. Outliers will be tested by Dixon's method at the 95 percent confidence level. In the event that any outliers are identified, the grid point supplying the outlier will be resampled to confirm the presence or absence of elevated radioactivity.

Outside nonmanufacturing areas that have been identified as contaminated or potentially contaminated as a result of knowledge of the processes, from measurement of external radiation levels, or from sampling and analysis in conjunction with the remediation assessment plan will be subject to further measurement of radiation as a part of the initial radiation survey. Instrumental radiation measurements as well as surface and subsurface sampling and analysis will be conducted to define and refine the boundaries of any contaminated areas. The location of sampling points and sampling density cannot be determined in advance, but will be sufficient in number and spacing to guide effective decommissioning activities to proceed.

Background air quality with regard to radionuclides will be determined by the examination of high volume air quality samples. The Fansteel property will have five air sampling stations established on it at the locations shown in the remediation assessment plan. The typical wind pattern for this area of the United States has air movement prevailing from the west and southwest. However, local wind conditions may vary from the regional norm. To insure that the upwind sample station(s) may be reliably identified each day samples are obtained, records will be maintained of local wind speed and direction by the installation of suitable instruments at the Fansteel property.

The air monitoring stations will be installed before any intrusive or dust producing activities take place as part of the decommissioning plan or remediation assessment plan activities. A minimum of 30 upwind air samples will be accumulated before decommissioning activities under this plan commence.

In addition to gravimetric and chemical analysis of high volume air samples, information will be obtained on radioactive material that may be present in air at or near the site. Upwind samples will be analyzed for gross alpha and beta activity. Results will be expressed both as microcuries per milliliter and as pCi per gram of airborne dust. Samples from upwind stations that show a statistically significant elevation in background radioactivity by either measure will be submitted for further analysis to determine the contributing radioisotopes. In the event that no upwind samples show statistically elevated levels of radioactivity, five upwind samples showing detectable radioactivity will be analyzed to determine the background isotopic makeup of airborne radioactive material.

Downwind samples will be similarly analyzed to determine if any radioactivity in airborne dust is originating from the site. Samples that show a statistically significant elevation in activity per unit mass of dust will be subject to further analysis to determine the identity of the contributing radionuclides. Statistical significance will be determined through the use of the single tailed value of Students t-Test at the 90 percent confidence level. In the event that a pattern of statistically significant increases is observed, a selection of downwind samples rather than all such samples may be submitted for individual radionuclide analysis. In the event that no downwind samples show statistically elevated levels of radioactivity, five downwind samples showing detectable radioactivity will be analyzed to determine the isotopic makeup of the airborne radioactive material leaving the site.

The program for sampling and analysis of ground and surface water is described in the remediation assessment plan. A sufficient number of groundwater samples will be obtained from the nominally upgradient wells to determine a statistically significant estimation of the background water quality with regard to concentration of radioisotopes. All upgradient water samples will be analyzed for gross alpha and gross beta activity. In addition, at least ten of the upgradient samples showing detectable levels of activity will be submitted for isotopic analysis to determine the concentration of individual radioactive species in the upgradient groundwater. These results will be compared with information on

regional groundwater quality to evaluate the possibility of site-wide influences on groundwater radiological quality.

All nominally downgradient wells will be sampled for gross alpha and gross beta analysis as part of the remedial assessment. The Remedial Assessment work plan further stipulates that samples exhibiting in excess of 15 picocuries per liter of gross alpha activity or 50 picocuries of gross beta activity will be analyzed to determine the contributing radionuclides. For the purposes of the Decommissioning Plan, at least ten downgradient samples (regardless of the 15 and 50 picocuries per liter threshold) will be analyzed to determine the distribution of radionuclides in the groundwater in the event that less than ten exceed the threshold.

In the event that any of the downgradient wells show statistically significant elevations of total activity, samples will be submitted for determination of the contributing species. The single tailed value of Students t-Test at the 90 percent confidence level applied to the background mean concentration will be used as the test for significant elevation of activity in a downgradient well. In the event that several wells show similar gross activities, or certain wells show similar gross activity over an extended period of time, selected samples may be submitted for individual radionuclide determination, rather than all such samples.

Process materials at the site will be sold for recovery purposes. As such, these materials are not properly addressed in a decommissioning survey except in the context of removal of noncommercial residual amounts of such materials from land areas, water, air, and building and facility surfaces. An initial radiation survey of bulk accumulations of process materials will not be conducted as part of the facility decommissioning survey.

The building and equipment surface survey will be conducted using a calibrated survey meter such as an Eberline SmartPortable or its equivalent with an alpha scintillation detector. A portable gas proportional counter may also be used for the surface survey. The instrument will be calibrated for thorium detection efficiency. All building surfaces, production equipment surfaces, building

facilities, and the surface of the ore storage pad and other paved areas used in the transportation or handling of the ores, slags, or process materials will be surveyed at a minimum density of not less than three 100-square-centimeter measurements per square meter of surface. Readings will be averaged over surface areas not exceeding one square meter. Equipment or facility surfaces that are less than one square meter in area will be averaged over the entire surface area. A record of all individual measurements and the location of those measurements will be produced to guide cleanup operations. For large building, pavement, or equipment surfaces, a grid will be established for denoting the location of sample points and averaged-value area boundaries.

In addition to the alpha activity survey, a gas-proportional counter operating in the beta-counting mode will also be used for the building and equipment surface survey. The frequency of beta measurements may be less than the frequency of alpha measurements based on observed surface conditions. Areas with dirty, oily, or irregular surfaces will be measured for beta activity at the same rate as that used for alpha particle activity. Clean surfaces in good mechanical condition may be measured at a lesser frequency but not less than one beta measurement per square meter of building or equipment surface.

Smears may be taken from specific areas showing elevated radioactivity during the initial building survey to evaluate cleanup strategies. The number, location, or distribution of such smears cannot be specified at this time.

Accumulations of dust or dirt within the buildings and on structures and facilities adjacent to the northern portion of the "Chem A" building will be sampled and analyzed for total radioactivity. Air ducts, vents, scrubbers, hood ventilation systems, fans, and other air movement devices will be surveyed and accumulations of solid matter will be analyzed for radioactivity. This measurement will be performed utilizing a suitable counting device calibrated to thorium. Measured counts will be adjusted for sample self absorption. After dust and dirt accumulations inside the structures or facilities have been analyzed for gross activity, a number of these samples will be chosen for further analysis to identify the specific radionuclides present.

Where concrete surfaces show high levels of total or removable radioactivity, concrete core samples will be obtained to determine the depth to which radioactive material may have penetrated. Similarly, any soil areas adjacent to the plant or at the ore storage area north of Pond No. 8 that are determined to be contaminated by radioactive material will be cored to determine the depth of the radioactivity. Soils underlying the concrete ore storage pad will also be sampled for the presence of radionuclides. The results of this surface radioactivity survey will be combined with the results of the environmental radioactivity survey to determine the precise scope of work that will need to be performed.

2.1.2.2 Decontaminating Process Equipment

The ball and vibratory mills for reducing ore particle size, the crushed ore classifying systems, their associated materials handling equipment, and all the process equipment in the "Chem C" building associated with the digestion, extraction, partitioning, and purification of the tantalum and columbium raffinates has been sold en bloc to an extra-national concern that will use the preparation and processing equipment in a plant essentially similar to the Fansteel facility. These items of equipment will be cleaned of all reasonably removable licensed material residues by the use of vacuum cleaners, hand scrubbing, steam cleaners, solvent washes, high-pressure power washers, etc., as may be compatible with the individual component's material(s) of construction. Every effort will be made to clean this equipment to the lowest practicable level of residual surface radioactivity.

These items are components of the Fansteel facility that will not necessarily be cleaned to the level prescribed for release for unrestricted use since these items of equipment will be used for exactly the same purpose for which they were used when the Fansteel facility was processing NRC-licensed materials. Washing and cleaning of this equipment will take place under controlled conditions. Vacuum cleaning will take place utilizing high-efficiency particulate air (HEPA) filtration to remove potentially radioactive particulates from the effluent airstream. Washing operations will take place on a specially constructed pad. Effluents from the cleaning operation will report to a settling basin where the particulates will be allowed to settle out. The supernatant wash water will be

sampled and analyzed for dissolved radioactivity. If the wash water is suitable for discharge, the supernatant will be pumped to the wastewater treatment plant for eventual discharge. The solids from the washing operation will be tested for the presence of licensed materials.

The licensed material, uranium and thorium incorporated into the ores and slags, is not soluble under any of the washing conditions to be used in cleaning the process equipment, building surfaces, or facility components. No leaching of radioactive species is anticipated into the washing effluent liquid phase. However, before pumping or otherwise discharging washing effluent to the settling basin, a sample of the liquid phase will be obtained, evaporated, and counted to determine the activity that may have transferred to the liquid. Washing effluent from this or any other decontamination process will not be discharged to the wastewater treatment plant if the activity of a sample passed through a 0.45-micron filter exceeds the standard for unrestricted discharge of soluble Radium 224; i.e., 60 picocuries per liter as shown in Table II of Appendix B, 10 CFR 20 as revised. Gross alpha activity will be used for this screening test; i.e., all detected alpha particle activity will be assumed to be due to this isotope of radium. If less than 60 picocuries per liter of total radioactivity are detected, then the discharge limitation will be considered to have been met without the necessity for determination of individual isotopes. If this 60 picocuries per liter standard is exceeded, the effluent will be tested for specific radionuclides contributing to the observed activity. If the effluent limit for radium (or any other listed radionuclide) is exceeded, the liquid phase material will be batch treated outside the normal wastewater treatment system or solidified for disposal as low-level radioactive waste.

After the equipment has been cleaned as described in the paragraph above, it will be dried and packed in appropriate preservative lubricants, packings, etc., as may be appropriate to the individual piece of equipment. These items will then be packed in suitable shipping containers for transport to their destination. If the equipment falls under the U.S. Department of Transportation (DOT) definition of radioactive materials following decontamination, all the requirements of DOT for the transport of radioactive materials including all necessary packaging, placarding, labeling, and routing will be strictly adhered to.

2.1.2.3 Shipping Process Equipment Off Site

As soon as the process equipment that has been purchased by the receiving client has been cleaned and packaged for shipment, Earth Sciences personnel accompanied by representatives of Fansteel will conduct an external radiation survey of the packages. Representatives of NRC and DOT will be informed of the time and place of this survey and may attend if they so desire. A written record will be produced of the external radiation survey.

When it has been established that the conditions for shipment of radioactive equipment have been met, the components to be shipped off site will be loaded onto suitable trucks and transported to their destination in the United States. The containers will then be loaded for shipment overseas. Fansteel's responsibility for the equipment will end when the materials leave the facility.

2.1.2.4 Decontaminate Buildings and Facilities

Based on the results of the initial radiation survey and site assessment detailed plans for the decontamination of building surfaces and any facilities and structures that will remain at the site will be generated. Any areas that averaged more than the allowable level of total or removable radiation will be cleaned with appropriate solvents, cleaning solutions, vacuum cleaners, etc. Some air ducts, benches, porous materials, and concrete may have to be removed as low-level radioactive waste.

"Hot spots," even in areas that when averaged meet the standard for unrestricted use clearance, will also be cleaned. To qualify as a hot spot in an otherwise clean area, a single 100-square-centimeter reading would have to reach a value of 2,500 disintegrations per minute as thorium. Hot spots will be cleaned to below this threshold level and the adjacent sample reading points will be rechecked to insure that the square meter average value total radioactivity remains at the level approved in the final plan.

Cleaning of building surfaces and facility components will be performed under controlled conditions. All effluents from the cleaning operation will be recovered for appropriate disposal. Liquid and solid residues that would be hazardous wastes when discarded will be segregated from other wastes and disposed

of in accordance with applicable regulations. Nonhazardous liquid and solid residues from building surface and facility decontamination will be analyzed for total activity prior to being discarded. Solid material that meets the NRC's and EPA's standard for unrestricted disposal will be discarded as conventional industrial debris in accordance with applicable solid waste management regulations. Liquid wastes that meet the NRC's standard for discharge to unrestricted areas will be routed through the wastewater treatment facility as specified in Section 2.1.2.2 above. Solid residues that are not hazardous wastes will be packaged and disposed of as low-level radioactive waste.

When the building surfaces and facility components have been decontaminated to the satisfaction of Earth Sciences and the client and when waste materials have been removed, a second radiation survey will be conducted. Measurements will be at least as dense as those for the initial survey. Any areas that require further decontamination will be identified and subject to further cleaning procedures or preparation for disposal. This procedure will be repeated until the area is determined to be clean.

2.1.2.5 Remove and Discard as Waste Those Building Materials and Facilities that Cannot or Will Not Be Decontaminated

It is expected that portions of the floor of the "Chem C" building, portions of the floor of the "Chem A" building, and possibly parts of the ore storage pad will have to be removed and disposed of as low-level radioactive waste. The storage pad may have been subject to a certain amount of spillage over the years and exposure to weather conditions has caused some deterioration and spalling of the concrete surface. This will allow small particles of ore and slag to penetrate the surface of the pad, resulting in unremovable radiation. The milling area of the "Chem A" building has had minus 200 mesh ore produced by grinding. Small particles of this ore may have become embedded in the floor, walls, or even ceiling of this building which may not be removable by any conventional washing process. In the "Chem C" building, aggressive chemical reagents, especially hydrofluoric acid, have caused deterioration of the concrete pad floor. It is presumed that spillage of ore and reagent mixtures have resulted in penetration of licensed material to some depth into this pad.

Other building surfaces and facility components that have been exposed to licensed materials and that were identified in the initial survey as being contaminated in excess of the approved limits will be cleaned by means appropriate to their material of construction. What areas those may be and what specific methods of cleaning will be appropriate cannot be specified at this time. However, the initial survey will be conducted in sufficient detail to identify areas in need of decontamination.

It is entirely likely and expected that certain building surfaces and facility components will not be economically cleanable. Such portions of structures or internal facilities will be cut or broken down into the smallest practicable size pieces and packaged as low-level radioactive waste. In addition to the concrete surfaces already mentioned in this section, such materials may include but are in no way limited to duct work, corroded sheet metal, porous materials of any sort, and flooring materials. All surface materials and components that will be discarded as low-level radioactive waste will be packaged and prepared for shipment to a licensed waste depository facility. Materials will be packaged in DOT-approved containers and an external radiation survey will be conducted before the containers are loaded onto trucks for transportation off site. A permanent written record of the external radiation survey will be made for later review.

A map will be made based on the initial survey results of those areas and facility components needing decontamination as a part of the decommissioning operation. Each area and component will be uniquely identified. The type of decontamination applied to each identified area or component will be recorded. Each area of building material or facility component that was discarded as a low-level radioactive waste will also be recorded together with the number or other identifier of the container(s) in which it was discarded. This inventory will be included as a part of the project permanent records. Internal and external radiation readings will be a part of the record of wastes shipped off site. The external reading will be taken immediately after the waste container has been sealed. The internal reading will be determined based on the surface radioactivity measured for the materials loaded into the container. Regardless of the internal radiation values, the external and external removable radiation must meet DOT requirements in 49 CFR 173.441 and 173.443 before the material will be

allowed to be shipped off site. A final radiation survey will be made of the external surfaces of the containers just before the containers are removed from the site.

2.1.2.6 Remove, Treat, and Package Process Materials

Pond No. 3 and closed Pond No. 2 are designated storage areas for ore digestion process materials. Pond No. 5 and perhaps other areas of the plant property have also been exposed to these materials or used for their storage. The remediation site assessment will identify any areas other than the designated storage areas where this material may be located.

The process materials, which contain the licensed material as well as a significant residual quantity of tantalum and columbium (as well as other rare earth and other metals), will not be discarded as low-level radioactive waste. This material will be managed for reuse as an ore. Then the material will be packaged for shipment overseas where it will be processed as tantalum ore. The packaged material will meet all applicable DOT specifications and NRC requirements for export of source material. Any remaining stocks of ores or slags will also be packaged for overseas shipment for use as raw materials.

It is possible that some of the process materials or soil or soil-like materials contaminated with process materials will not be suitable for processing as tantalum ore. If this is found to be true, such materials will be stored on site and then packaged for disposal as low-level radioactive waste.

2.1.2.7 Remove, Decontaminate, and Package Pond Liner Material as Waste

The pond liner consists of approximately 100,000 square feet of plastic sheet. After all removable process material has been taken out of the pond, the liner will be rinsed down and progressively removed. As the liner material is removed, it will be cut into pieces of suitable size and placed into approved containers for removal to a permanent disposal site.

There is also a layer of plastic material serving as a cover over the material stored in Pond No. 2. This cover will also be discarded. The Pond No. 3 liner and Pond No. 2 cover will be decontaminated prior to disposal. If they meet the

criteria for release for unrestricted use, they will be discarded as conventional waste. If they do not meet these criteria, they will be properly disposed of at an appropriately permitted facility.

2.1.2.8 Remove and Package Contaminated Soils and Other Solid Material for Disposal

An unknown amount of contaminated soil and other solid materials is believed to exist at the site. This includes soils from areas immediately adjacent to the location of ore storage and processing areas, old process material impoundment embankments, and soils contaminated as a result of the June 1989 release from Pond No. 3. These areas of soil contaminated by licensed material will be identified during the remediation site assessment.

Soil that is contaminated in excess of the standard for release for unrestricted use may be handled in one of two ways. If the soil contains in excess of a total of 10 picocuries per gram of combined uranium and thorium isotopes but less than 50 picocuries per gram of combined uranium and thorium isotopes, it may be blended with a sufficient volume of uncontaminated soil to result in a mixture that contains less than 10 picocuries per gram of combined uranium and thorium isotopes. Prior to blending, soil samples will be taken in sufficient number to characterize the distribution of radioisotopes contained in the soil including daughter products of the decay of uranium and thorium.

Soil that is considered a candidate for blending will be sampled initially at a rate of one sample per 225 square feet of surface for each vertical foot of contaminated material. This corresponds to one sample per 10 cubic yards of material for blending. Samples will be subject to isotopic analysis to determine the distribution of radioactive constituents. These results will be used to guide selection of contaminated soils and determination of blending ratios. Uncontaminated soils for blending will be obtained from on-site locations identified during the initial site survey effort as being characteristic of local background conditions.

Soils that are found to be contaminated in excess of 50 picocuries per gram with uranium and thorium isotopes will not be blended. This material will be prepared

for disposal as low-level radioactive waste in a suitable repository to be determined at a later date based on disposal regulations, availability of space, and disposal costs as they may apply at the time of disposal of this material.

2.1.2.9 Dispose of Low-Level Radioactive Wastes

Low-level radioactive wastes will be disposed at licensed locations. Depending upon the amount of wastes generated during the decommissioning operation, shipment for waste disposal may occur at the end of the project or from time to time during the course of the project as economically sensible quantities of waste are accumulated.

All shipments will be in DOT- and NRC-approved containers. A record will be made of each container and its contents including a description of the material in each container, its origin within the facility, and its activity. Measurements of the external radioactivity will be made immediately prior to loading the containers for shipment. No container that exceeds the DOT standards for external radiation will be transported. Because of the nature of the licensed materials on this site, this situation should not arise.

2.1.2.10 Conduct Final Decommissioning Survey

A decommissioning survey will be conducted when all plant facilities are believed to be decontaminated to the levels required for release to unrestricted levels. The decommissioning survey will address the entire plant area and surrounding property.

An external radiation survey will be conducted over the entire area subject to remediation. This external radiation survey will be conducted using a ten meter grid. The same types of measurements will be taken for this survey as were obtained for the initial survey. Results of external radiation measurements will be compared against the background level established in accordance with the initial soil survey.

A minimum of 20 soil samples will be taken from remediated areas. Remediated areas include areas of uncontaminated soil that may have been used for blending purposes. These samples will be subject to determination of gross alpha and

gross beta activity. Twenty-five percent of the soil samples will be further characterized for isotopic distribution of radioactive constituents. Gross alpha and gross beta results will be compared with results determined as characteristic of background. If comparison against established background levels indicates that these samples do not meet the criteria for release for unrestricted use, they will be subject to further analysis to identify the radionuclides present that are contributing to the excess radioactivity.

At least ten soil samples will be obtained from areas not previously found to contain contaminants in order to ascertain that no areas of contamination are likely to have been overlooked. These samples will be subject to gross alpha and gross beta determination, with subsequent radionuclide identification if needed.

If any further contaminated soil or other earth material is discovered in the course of this survey, it will be blended or disposed of as low level radioactive waste as specified in Section 2.1.2.8. Any of treated or blended soil are found that do not meet the standard for release they may also be subject to further treatment, blending, or disposal as low level radioactive waste.

The buildings and facility components that will remain on the site will be surveyed at the same density and spacing as that used for the initial decommissioning survey. Any areas found to be contaminated beyond the criteria for unrestricted use will be decontaminated again or else removed and disposed of as low-level radioactive waste.

2.1.2.11 Site Grading and Drainage Adjustment

Depending upon the amount of soil and other earth materials that must be removed in the course of the decommissioning, some adjustments to the site's physical arrangements may need to be made. The final grading and revegetation of disturbed areas will be compatible with adjacent undisturbed landforms. Surface drainage courses will be integrated with the landscape and compatible with undisturbed natural drainage systems. A suitable mixture of adapted ground covers will be seeded onto bare or disturbed areas.

2.1.2.12 Alterations to the Tasks

As information is developed during the building survey and the remediation site assessment, the relative importance of various tasks identified above may be altered. Entire new tasks may have to be added and it is even possible that some may be eliminated in their entirety. As changes are made to this section of the decommissioning plan, we will submit revised pages to NRC for its review and comment. The bearing of changes in task description on project cost estimates will also be evaluated.

2.1.3 Proposed Schedule

This Decommissioning Plan is by necessity a conceptual document rather than a detailed work plan at this time. Scheduling of many decommissioning activities is contingent upon approval of the remediation site assessment work plan. The remediation site assessment must be performed in order to identify and quantify contaminated material at the site. The remediation site assessment work plan was submitted to the following government agencies:

- USEPA
- NRC
- Oklahoma Water Resources Board
- Oklahoma Department of Health

Upon receiving approval from the NRC and any other applicable agency to the site assessment work plan, Fansteel is prepared to move expeditiously to conduct the approved remediation site assessment. Certain elements of the preliminary Decommissioning Plan will be implemented in advance of approval of the remediation site assessment work plan. The building and facility surface radiation survey will be conducted during the period August to October of this year. Process equipment is presently being removed from the buildings, cleaned, and loaded for shipment. The process materials in Pond No. 3 and other locations are also being removed, treated, and packaged for shipment overseas. These activities will continue until they have been completed regardless of other remediation site assessment or decommissioning activities that may be taking place. Subsequent decommissioning schedules must await the results of the remediation site assessment and the building and facility surface radiation

survey. A proposed schedule will be submitted to the NRC as soon as it can be developed.

2.2 Description of Techniques to Accomplish Task Completion

Decommissioning of the buildings, process equipment, and building facilities will be a fairly straightforward operation. Materials will either be economically cleanable by conventional cleaning techniques or the materials will be broken down into the smallest possible pieces for scrap and disposed of as low-level radioactive waste. The activity in the ore, process material, and wastes will be extremely low. Only low concentrations of source material are present at the site of this operation.

Decommissioning of the adjacent land areas and the process material storage impoundments will involve some novel operations in addition to conventional earth moving activities. Contaminated soils may be removed from their present location and blended with other soils to make a mixture that is below the unrestricted release level, or the soil may be transferred into approved containers for transportation off site for permanent disposal at a licensed facility. Some soils contaminated with ores or slags may also be packaged and shipped off site, but as a raw material for further metals recovery.

The material in Pond No. 3 contains a substantial amount of residual MIBK. The MIBK will be forced out of the residue using heat to drive off this substance. The organic solvent will then be combusted. These processes may also have to be carried out on the material stored in closed Pond No. 2 and in any other location where process materials may have been stored in the past. This material from locations other than Pond No. 3 will be tested for MIBK to determine whether or not any solvent is present.

2.2.1 Conventional Cleaning Techniques

These techniques will be employed on building surfaces, concrete pads, process equipment, and building facilities. Conventional cleaning techniques include:

- vacuum cleaning,
- brushing/scraping,

- wet scrubbing,
- steam cleaning, and
- pressure washing.

The contamination to be removed is in a readily dispersible form (i.e., small particles of ore containing low concentrations of uranium and thorium). These cleaning techniques are particularly suitable for the removal of dispersible materials.

Certain precautions will need to be taken with the conventional cleaning of site facilities and components. The principal radiological hazard involved in this cleanup operation will be from the potential inhalation of dust bearing uranium and thorium. This is particularly true of dry removal techniques.

When materials are being vacuumed to remove loose surface dirt, the vacuum cleaning unit must be equipped with a HEPA filter. Also, the vacuum cleaning unit will be separated from other workers by a plastic curtain. The outside vent of the vacuum cleaner will be conspicuously marked and an air sample will be periodically obtained. This air sample will be analyzed for gross alpha and gross beta activity. If the measured activity exceeds allowable exposure standards or if the measured activity exceeds the measured background air quality by a factor of three it will be subjected to further analysis to identify the contributing radionuclides. When HEPA systems are vented to the outside, at least one exhaust sample will be obtained every week the device is in operation.

After the loose dirt has been removed, bristle and/or wire brushes of various sizes and styles will be used to loosen any caked on or otherwise hardened accumulations of ore or process material. During the time that this is taking place, access to the site being cleaned will be restricted to those persons having an assigned task in the area. A suitable dust respirator and protective clothing will be worn by all personnel who could be exposed to airborne radiation. A program of personal exposure monitoring will be implemented at each work area where conventional cleaning techniques are being used. This program will involve taking personal monitoring samples each day that this activity takes place. At least one person in each work area will be monitored for exposure to

airborne radioactive material. He will be provided with a personal sampling pump equipped with a suitable filter. At the end of the shift the filter(s) will be collected and analyzed on site for rapid determination of levels of airborne radiation.

During any dry brushing or scraping operations, a vacuum cleaner will also be used. The vacuum cleaner will be used to remove dust and dirt loosened by the brushing operation and trap it in the vacuum cleaner's HEPA filter. Spent filters and vacuum cleaner contents will either be discarded as low-level radioactive waste or used for recovery purposes depending on the known or suspected quality of the material as an ore. Used respirator cartridges and protective clothing will be discarded as low-level radioactive wastes.

Conventional wet cleaning involves the use of detergent and water together with suitable sponges, brushes, mops, etc. After material that can be removed dry has been cleaned off, wet techniques can be used to remove further material. Conventional wet cleaning should be used only on nonporous surfaces such as metal, plastic, composite materials, glass, and tiled areas. It is less effective on porous materials. In most cases, contaminated porous materials will be discarded rather than decontaminated. Suitable containers for this purpose will be maintained at the location of the cleanup activities whenever contaminated materials may need to be discarded.

Pressure washing and steam cleaning will be used on large surfaces such as building walls, ceilings, and floors, large pieces of equipment, and areas difficult to reach by hand. These devices allow much more vigorous cleaning action than is possible by hand, as well as more efficient washing of large surfaces. An industrial rotary-type floor scrubbing machine may be used in conjunction with steam or pressure washing for concrete pads and building floor areas.

Effluents from wet washing operations must be managed as specified previously. Solid materials will be tested for radioactivity and disposed of according to the results of the analysis. The solids may be discarded as low-level radioactive

waste, conventional waste, or sold as raw material. Liquids, after testing for dissolved radionuclides, may be routed through the wastewater treatment system.

2.2.2 Concrete Removal

If concrete surfaces must be removed, a variety of devices are available. The choice will be governed by the amount of concrete to be removed, the depth to which the concrete must be removed, the orientation of the surface, and the mechanical properties of the concrete. If a fairly thin layer of concrete must be removed to a maximum depth of approximately one-half inch, a rotary shot blast device can be used. This is a dry removal method, so the equipment will have to be equipped with a HEPA filtration system to prevent generation of airborne low-level radioactive material.

In situations where a greater depth of concrete removal is necessary, an ultra-high-pressure water laser will be used. This device is a wet cutter, so use of HEPA filtration is not needed. Liquid waste from this process will be handled by the same techniques as were specified for conventional washing.

If concrete must be removed from vertical surfaces, a "scrabbler" will be used. This is a mechanical dry removal device which uses many small oscillating cutting heads to effect material removal. HEPA filtration air management will be required during use of this device.

All concrete removed as part of the decommissioning program will be considered to be low-level radioactive waste. The material will be packaged as it is removed in containers suitable for transportation to the chosen disposal site. Spent HEPA filters will also be treated as low-level radioactive waste and managed appropriately.

2.2.3 Removal of Building Facilities

The initial radiation survey and analysis of dust and wipes from building facility surfaces will be used to determine whether the building facilities will be decontaminated or discarded. Building facilities include such things as piping, ducts, benches, hoods, shelves, partition walls, furniture, etc. Any of these that will not or cannot be decontaminated to unrestricted release criteria

will be disposed of as low-level radioactive waste. Materials that will be discarded will be dismantled to the extent practicable and then reduced further in size by cutting or crushing as may be appropriate to the material of construction, size, and shape of the individual item. Materials for disposal will be reduced in size such that they will fit into approved containers for transport to a licensed disposal facility.

2.2.4 Treatment of Process Materials

The ore digestion material will need to be processed prior to being packaged for shipment off site. The process material in Pond No. 3 contains MIBK as well as the ore digestion solids. The process material will be slurried and pumped from Pond No. 3 using a high solids pump or other effective means. The solids will be immediately transferred to a storage hopper from which the material will be fed into a modified calciner. The calciner will raise the temperature of the material to drive off and combust the MIBK residues.

Washing effluent from this or any other decontamination process will not be discharged to the wastewater treatment plant if the activity of a sample passed through a 0.45-micron filter exceeds the standard for unrestricted discharge of soluble Radium 224; i.e., 60 picocuries per liter alpha activity as shown in Table II of Appendix B, 10 CFR 20 as revised. If this standard is exceeded, the effluent will be tested for specific radionuclides contributing the observed activity. If the effluent limit for radium (or any other listed radionuclide) is exceeded, the liquid phase material will be batch treated outside the normal wastewater treatment system or solidified for disposal as low-level radioactive waste.

The other accumulations of process materials on the site will be sampled and analyzed. We will determine at that time what type of treatment, cleaning, or processing may be required of these other process materials prior to packaging for shipment overseas.

The radioactivity of the materials packaged for overseas shipment will be analyzed by an outside laboratory prior to shipment. The material will be analyzed for total activity, total uranium, and total thorium as well as such

other tests for metal values as may be requested by the receiving organization. A record of the concentration and absolute quantity of source material(s) in the process materials will be maintained. If the concentration or absolute quantity of source material exceeds the general license limitations, an export license will be obtained. The general license limitations are that uranium or thorium not exceed 0.05 percent by weight of the material exported (no quantity limit) or not exceed 1,000 kilograms of uranium or thorium per year (see 10 CFR 110.22).

2.2.5 Removal of Pond No. 3 Liner Material and Pond No. 2 Cover

These are conventional earth moving and construction operations. As soon as the contents of Pond No. 3 have been emptied, the liner material will be lifted out in sections and rolled up. The sections of the liner material will be cut to such size that they can be rolled and/or folded to fit into suitable containers for transport and disposal.

Liner sections will be washed down with water prior to removal and handling. Wash water will be managed as discussed in previous sections. It will be tested to insure that it meets the soluble Radium 224 discharge limit prior to treatment in the wastewater treatment plant.

Conditions and materials below the liner are unknown. As liner material is removed, the exposed materials will be sampled and analyzed for the chemical as well as radioactive characteristics. Pond No. 3 was constructed on the site of two previous containment structures. Some process material may still remain below the liner of the current Pond No. 3. Any additional process materials that may be found during liner removal will be processed in the same manner as the other materials as discussed in Section 2.2.4 above.

Contaminated soils as well as process materials may also be encountered below the impoundments. Soils located below the impoundments will be analyzed in accordance with the procedures described in the initial site survey, Section 2.1.2.1, to determine if they are or may be contaminated with radioactive materials and to generate an estimate of the amount of material so affected. Sampling frequency and analytical programs will be comparable.

There is a plastic cover over the closed process material storage impoundment (Pond No. 2). This cover is in turn covered with a layer of soil. The soil will be removed to expose the plastic cover material. Sections of cover plastic of suitable size for packaging for transport and disposal will be removed and placed in suitable containers. The plastic cover and liner material will be cleaned prior to packaging. Remaining radioactivity on both the Pond No. 3 liner and the cover plastic will be monitored for each container as it is loaded. If possible, the liner and cover materials will be decontaminated to the criteria for release for unrestricted use. If this can be achieved, the materials will be disposed as conventional waste. If these criteria cannot be met, the material will be disposed as low-level radioactive waste. For any material disposed as low-level radioactive waste, external levels of radiation will be determined as each container is filled and again when the containers are loaded for transport to the disposal facility.

2.2.6 Remove Contaminated Soil

Location of areas of contaminated soil or of other solid materials including process materials that fail to meet the purchaser's specifications will be determined during the remediation site assessment. Quantitative estimates will be made at that time based on the findings of the remediation site assessment.

Two different types of contaminated soil will be addressed. "Slightly contaminated soil" refers to soils that contain no more than 50 picocuries per gram of uranium and thorium above background. "Contaminated soil" refers to soils that contain more than 50 picocuries per gram of uranium and thorium above background. Different management strategies will be used for the two types of soil provided that other hazardous constituents do not interfere.

Slightly contaminated soil may be blended with other soil on the site to produce a mixture that is within the acceptance criteria for release for unrestricted use. There are large areas of undeveloped ground at the site which provide a local source of uncontaminated soils. If blended, the slightly contaminated soil will be spread over clean soil in a thin layer after which the slightly contaminated soil will be mixed with the underlying uncontaminated soil using

conventional farm or construction machinery. The disturbed ground will then be revegetated to control runoff and erosion.

Contaminated soil, (i.e. soil containing in excess of 50 picocuries per gram) of uranium and thorium above background will not be treated by blending with native uncontaminated soils. These soils as well as any other contaminated solid or semisolid material that will not be shipped overseas for recovery purposes as tantalum ore may be disposed of as low-level radioactive waste. Soils and other materials will be stockpiled in a controlled location until a suitable quantity of material is accumulated for packaging for shipment off site. Contaminated soils will be placed into appropriate boxes or drums and sealed. Activity of the contents of each box will be determined and the external radiation will be measured immediately upon filling the container. External radiation will be measured again when the containers are loaded for transport to the disposal facility. Any semisolid materials or liquids that must be packaged for transport will be solidified prior to being placed into containers.

2.2.7 Disposal of Low-Level Radioactive Wastes

Low-level radioactive materials on the site that may be removed consist of the following substances:

- Process materials
- Contaminated building surface materials and facility components
- Contaminated soils
- Produced contaminated materials generated by cleanup operations
- Liner and cover materials, if radioactive

All materials except the process materials and some of the contaminated soils may be disposed of as low-level radioactive wastes.

Materials for disposal will be packaged securely in accordance with the requirements of DOT. Radiation readings will be obtained for the materials being placed

in packages, at the surface of the package, and at a one-meter-distance from the highest surface reading obtained. The packages will then be labeled appropriately based on these readings. Any other packaging requirements of the receiving facility will also be complied with to insure prompt handling and disposal to the materials discarded as low-level radioactive wastes.

2.2.8 Final Decommissioning Survey

2.2.8.1 Instrument Survey for Surface and Removable Radioactivity

The final decommissioning survey will be conducted after all decommissioning activities have taken place and the entire facility is believed to be decontaminated to the levels required for release for unrestricted use. Building surfaces, storage areas, and facility surfaces will be measured for surface activity using survey meters and wipe samples. The criteria contained in the document entitled, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material" dated August 1987 will be used to guide the final decommissioning survey for building and facility surfaces and storage area surfaces.

The instrument survey may be conducted using several different instruments. One will be a low level gamma radiation detector such as the microR meter for determining external gamma radiation exposures. A thin window beta/gamma detector will also be used. Alpha particle radiation must also be determined for the final decommissioning survey. An instrument such as the Eberline SmartPortable with an alpha scintillation detector or a portable gas proportional counter may be used for determination of alpha emissions from building, component, and facility surfaces. A gas proportional beta counter will also be utilized in the final building and equipment surface survey. At least one beta measurement per final survey block (area of 1 meter square) will be obtained.

Gamma and beta/gamma counters will be calibrated to units of absorbed dose. The surface alpha counter will be calibrated to its thorium detection efficiency.

In order to meet the requirements of the above-referenced guidelines, each surface with an area in excess of one square meter will be divided into a grid with individual grid subareas not to exceed one square meter. Each subarea will be measured at least three evenly spaced locations and the individual values will be averaged for each subarea. The activity at each measuring location will be determined by the following equation:

$$\text{Activity} = (\text{Detector area}/100\ \text{cm}^2) \times (\text{Instrument Reading}) \times (\text{Thorium Efficiency})$$

In the event that a surface or a material fails to meet the criterion for release for unrestricted use based on the consideration of all activity detected being due to thorium, Fansteel may elect to have a radionuclide analysis performed to determine the contribution to the measured activity due to each regulated radionuclide. This option would generally be exercised only in situations where a surface or material failed to meet release criteria utilizing the conservative default by a narrow margin.

Since the composition of the contaminants is not well characterized with regard to the relative proportion of thorium and uranium, all counts will be considered as arising from thorium. This is a conservative assumption since the unrestricted use release criterion is lower for thorium than for uranium surface activity.

At locations which show in excess of 200 disintegrations per minute per 100 square centimeters, a wipe sample will be obtained for determination of removable radiation. The wipe will be counted in the beta plateau region of a suitable gas flow proportional counter (Canberra, Model 2201) or equivalent. The counter will be properly calibrated for the wipe materials used for taking surface samples. Counts will be adjusted for historical background, wipe material self-absorption characteristics, and wiper mass loading if significant. Counts will be accumulated for at least 30 minutes on final decontamination survey samples.

Any areas that fail to meet the release criteria because of either the average or maximum surface radioactivity or the removable surface radioactivity will be

marked for further cleaning. After these areas have been cleaned further, they will be surveyed again. Cleaning will be continued until the area achieves the required level of cleanup or it is determined that the surface cannot be cleaned to the unrestricted release criterion. In this case, the surface material will be removed until unrestricted use criteria are met or the object will be discarded as radioactive waste.

2.2.8.2 Sampling and Analysis for Environmental Contamination by Source Material

Environmental materials will be sampled and analyzed for the presence of radioactive contamination at the end of the site cleanup operation. This survey will be performed to determine that the release for unrestricted use criteria has been achieved for the land area occupied by the licensed facility. The following types of materials will be sampled:

- Soils (and other earth materials) in areas where source materials were known to have been stored or discarded.
- Materials underlying storage areas and impoundments.
- Areas where slightly contaminated soils were blended with other soils on the site.
- Unaffected areas.
- Groundwater.
- Airborne particulates.

Soil samples will be taken at the surface and at a depth of one foot. In areas identified in the initial site survey as having been affected by source materials and areas underlying source material storage facilities or impoundments, sampling will be performed on 50-foot centers. Individual samples will not be composited. Soil blending areas will be sampled on 10-foot centers and composited at a rate of five increments per composite. All increments in a particular composite will be derived from the same depth. Unaffected area samples will consist of one sample per acre for surface soil and soil at a one foot depth. Each sample will represent an area of one acre and will be composed of five evenly spaced incre-

ments. A minimum of ten unaffected area samples from each target horizon will be obtained.

Each monitoring well will be separately analyzed for the presence of radionuclides in the groundwater. The monitoring wells used for this survey will be the ones constructed in support of the remediation site assessment as well as any others that may be installed as a result of environmental remediation activities.

Upwind and downwind air samples will be monitored for the presence of airborne radioactive materials throughout the course of site cleanup/decommissioning activities. Samples will be taken using high volume total suspended particulate samplers as specified in the remediation site assessment plan. Samples will continue to be taken after decommissioning activities have been complete until a significant history of no detectable off-site migration of airborne radionuclides has been achieved. A minimum of 15 upwind and downwind airborne particulate samples and determination made of both the total amount of particulates and the radioactive characteristics of the particulates will be obtained. Depending on the variability and precision characteristics of the data and the observed values of radioactivity, more samples may be taken. This decision will be made when a minimum of 15 paired upwind and downwind samples have been obtained and analyzed.

Samples of environmental materials will be suitably prepared and counted on a gas flow proportional counter at the beta plateau and the alpha plateau region. The counter will be calibrated using known traceable sources. Adjustments to the measured counts for sample self absorption will be made. Air sample filter media will be used for determining self absorption of airborne particulate contamination. Uncontaminated groundwater will be evaporated to provide a mass diluent for determination of self absorption curves for soil and groundwater. Counts will be accumulated for a minimum of 30 minutes.

2.3 Standard Operating Procedures

Standard operating procedures will be established to guide all phases of the work involving decommissioning and decontamination of the site. These procedures will

be developed and/or approved by licensee management. Each decommissioning task, laboratory operations, health and safety protection, and project evaluation operation will be subject to guidance or control by an appropriate procedure.

Standard operating procedures will be prepared and approved by the licensee or by others at their request subject to approval by the licensee. These procedures will be in an established format identical to or compatible with other operating procedures in use at the site for other activities. Upon approval of a procedure, it will be implemented by the supervisory personnel with responsibility to licensee management for the accomplishment of the task covered by the procedure. This may be either licensee or contractor personnel. The following are tasks or activities that will be subject to control by standard operating procedures:

- Conducting radiation surveys
- Cleaning building and other surfaces
- Cleaning equipment for shipment off site
- Handling process materials
- Dismantling structures and facilities
- Radiation measurement instruments operations
- Sampling soil, water, and air for radiation measurements
- Packaging materials for shipment off site
- Packaging radioactive waste for off-site disposal
- Health and safety procedures for work with hazardous and/or radioactive materials
- Performing ground control operations
- Documenting decommissioning activities
- Blending slightly contaminated soil
- Identifying contaminated materials

Existing procedures will be reviewed to determine which may be applicable to decommissioning activities. New procedures will be produced where necessary and existing ones will be revised and approved in cases where this is appropriate. As work progresses, new procedures may be found to be necessary or new tasks needing procedures may be identified. A current copy of all appropriate procedures will be maintained at the work site. Copies of all procedures in use for the decommissioning operation will be available through the plant radiation safety officer (PRSO) office at the site.

2.4 Decommissioning Organization and Responsibilities

Decommissioning operations will be conducted by Earth Sciences under the general supervision and control of the licensee. Project planning, day to day scheduling, and operational decision making will be the responsibility of the contractor subject to the review and ultimate approval of the licensee. The licensee will also provide some technical support and may provide some additional manpower as needed.

2.4.1 Licensee Personnel and Authority

The following licensee personnel will have oversight or technical assistance responsibilities for the conduct of the decommissioning operation:

- Mr. John J. Hunter - Corporate Manager of Process Engineering and Facilities Construction; Corporate level supervisory/oversight authority over all activities conducted at the Fansteel facility including the decommissioning operation.
- Ms. Carole A. Simpson-Vaughn - Q.A. Manager; Facility level oversight authority over contractor adherence to specified work plan requirements and successful completion of decommissioning objectives.
- Mr. Theodore Pantle - Laboratory Manager and PRSO; Preparation and analysis of samples and maintenance of laboratory records.

2.4.2 Contractor Personnel and Authority

Generation of work plans, implementation of those plans, data management, audits, and report preparation performed during the decommissioning will be carried out

by contractor personnel under the general oversight of Mr. Hunter of Fansteel. The following personnel will be specifically assigned to this project with the following identified responsibilities:

- Mr. Gary W. Berman - Project Director, Executive Vice President, Operations, Earth Sciences; Mr. Berman has corporate level responsibility for the planning and implementation of all project activities to insure compliance with the client's requirements.

- Mr. Joseph M. Harrick - Project Manager; Mr. Harrick is in day to day control of all project activities at the site whether relating to environmental cleanup or decommissioning activities.

- (To be determined) - Site Coordinator; Mr. _____ will be responsible for day to day supervision of Earth Sciences and subcontractor activities at the site.

- Paul N. Taylor - Health and Safety Coordinator and Radiation Safety Officer, Earth Sciences; Mr. Taylor is responsible for the generation and implementation of site chemical and radiological health and safety programs. He will also develop, administer, and maintain records of health and safety training provided to all personnel not directly employed by the licensee.

2.4.3 Personnel Qualifications

The qualifications of the licensee and contractor personnel named above are included in this plan as Appendix A.

2.4.4 Organization and Function of the Project Team

This decommissioning operation is a contractor-led project. Work plans are generated by the contractor with input and assistance from the licensee. The licensee maintains approval authority over all work plans and scheduling decisions. After the work plans have been approved by the relevant government agencies, the actual scheduling and conduct of work activities will be handled by the contractor project team, the key members of which have been identified above. Regular meetings will be held with licensee personnel to keep them informed of work progress and aware of any situations that may develop to require changes in work plans and the proposed schedule. The site health and safety

officer, who will also function as the contractor radiation safety officer, will operate under the authority of the licensee radiation safety officer or his designee.

Project meetings will be held from time to time and at the request of licensee project or senior management or government agencies with oversight responsibilities. These meetings will take place on no fixed schedule but rather in response to requests or progress on the project. Project meetings will be held in order to attain the following defined milestones:

- Commencement of field operations relating to the environmental assessment.
- Completion of environmental assessment field operations.
- Presentation of results of the environmental assessment.
- Completion of decommissioning activities except final radiation survey.
- Completion of final radiation survey.
- Presentation of final report documenting radiation and chemical cleanup operations.

Working meetings to address specific questions or matters arising during cleanup and/or decommissioning operations will be held as needed among the project staff. A record of each project management meeting relating to decommissioning operations will be produced for the file.

2.4.5 Subcontractor Management

Subcontractors will be subject to the approval of the licensee. They will be proposed by the contractor and, if accepted by the licensee, will work under the general direction of the contractor including adherence to the contractor's health and safety plan for radiological and chemical health and safety control.

Because of license requirements, the contractor's health and safety function will operate in close coordination with the licensee's function. The licensee will

have to specifically approve the contractor's health and safety plan as compatible with the health and safety plans and procedures already in place at the facility and in conformance with the requirements of the license. Regular reports to the licensee radiation safety officer will be provided to insure that the licensee's license commitments are being maintained at all times during the decommissioning activity.

2.4.6 Training

Contractor personnel will receive site- and task-specific training to enable them to work safely with and around the radioactive material that will be handled in the course of the decommissioning activity. This training material will be prepared and presented by Earth Sciences' radiation safety officer. The training course will address the following subject areas:

- Nuclear processes.
- Physiological effects of ionizing radiation.
- Principles of radiation detection and exposure monitoring.
- Radiation protection standards.
- Nature and intensity of radioactive materials known or believed to be present at the site.
- Procedures for the safe handling of dispersible source materials.
- Procedures for the safe cleaning of contaminated surfaces.
- Use of personal protective equipment.
- Packaging radioactive wastes for transportation and disposal.

A training manual addressing these subjects will be prepared and presented to each contractor and subcontractor employee whose job function requires exposure or potential exposure to radioactive materials. The training course will consist of a series of lectures and demonstrations conducted by or under the supervision

of Earth Sciences' radiation safety officer. A written record of training will be maintained which will record and document the following:

- Names of persons receiving the training
- Names of persons providing the training
- Dates of training activities
- Subject matter covered
- Examination results
- Copy of training certificate issued upon successful completion of the training course

In addition to the general radiation safety training provided to all workers involved in the decommissioning activity, there will be additional safety training provided on a continuing basis throughout the course of the project. This training will be provided as new tasks are begun or as new types or degrees of hazards are encountered. These training programs will be prepared as warranted by work activities and presented as needed to employees involved in the operations addressed by the training. A written record of such additional training will be maintained.

2.4.7 Contractor Assistance

This decommissioning operation will be carried out by a contractor and subcontractors as needed. The licensee will function in a general oversight capacity and as a provider of certain technical services in support of the decommissioning. All decommissioning operations will be performed under the facility's NRC license and subject to its conditions and restrictions for the possession of source materials.

2.4.7.1 Contractor Qualifications

Earth Sciences will be the contractor for the decommissioning operation. This company and/or its operating affiliates have performed cleanup of facilities contaminated with dispersible source material and have previously conducted

evaluations for cleanup and decommissioning including substantial preliminary work on the subject site.

The contractor and its laboratory affiliate currently hold two NRC licenses and have staff trained in radiation safety. Earth Sciences has an established radiation and chemical safety training function which is capable of providing all necessary instruction and guidance in the safe handling of both hazardous materials and radioactive substances. The contractor has developed a radiation safety program for this decommissioning operation that will meet all the requirements of the radiation protection standards. Administrative programs for demonstrating compliance with those standards are in place.

The contractor may, with the approval of the licensee, employ subcontractors to perform certain tasks related to decommissioning. Subcontractors must demonstrate their capability to safely perform any work at the site in conformance with the work plan, the site health and safety plan, and the facility license. Subcontractors will be under the general oversight of the contractor's site operations coordinator and the licensee's site management and PRSO.

2.4.7.2 Licensee Administrative Controls

Because the responsibility for operation under the facility NRC license is not subject to delegation, Fansteel management will have to maintain certain records and demonstrate control of the licensed material being handled at all times. This will be accomplished by a regular program of information exchanges and project approval procedures between the licensee and the contractor. The following will be among the licensee administrative controls:

- The licensee will formally approve the work plan for the decommissioning operation.
- Any significant changes in the work plan will be formally approved by the licensee.
- The licensee will approve any subcontractors employed on the site for decommissioning activities.

- The licensee will generate or approve the standard operating procedures developed pursuant to Section 2.3 of the Decommissioning Plan.

- The licensee will conduct regular periodic inspections of the decommissioning operation and produce a written record of the inspection and findings.

- When wastes, process materials, or equipment containing licensed material are shipped off site, the licensee will be responsible for confirming the accuracy of the external radiation readings.

- Only the licensee can execute documents authorizing the off-site shipment or disposal of any wastes, process materials, or equipment containing licensed materials.

- The contractor will provide a roster of all personnel working in areas that may involve exposure to low-level radioactive materials.

- The contractor will provide current instrumental and dosimeter exposure records to the licensee's PRSO.

- The contractor will provide current reports of low-level radioactive waste generation, mode and location of storage, and anticipated date of disposal.

- The contractor will provide current information on the production and packaging of process materials and equipment for shipment off-site.

- The contractor will conduct site ambient radiation exposure surveys on a regular basis and provide the results to the licensee in a timely expeditious manner.

- The contractor will provide the licensee with copies of all safety training and safety monitoring activities.

- The licensee will conduct periodic audits of the contractor's radiation safety program.

Any other administrative controls that may be needed to satisfy the licensee's obligations under the terms of the license will be implemented as necessary. All reports and documents must be maintained on the site in a manner suitable for easy access by authorized representatives of the Nuclear Regulatory Commission.

King

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January 28, 1992

Mr. Jerry J. Swift, Section Leader
Advanced Fuel and Special Facilities Section
Fuel Cycle Branch
Division of Industrial and Medical Nuclear Safety
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Transmittal
Remedial Assessment Work Plan Dated June 1990
Decommissioning Plan Dated February 1991

Dear Mr. Swift:

Fansteel Metals (Fansteel) and their consultant, Earth Sciences Consultants, Inc. (Earth Sciences) have completed revisions to the subject documents in accordance with the U.S. Nuclear Regulatory Commission's recent comments. Attached are our response letters and where applicable, revised text. Following your review of these documents, we would like to schedule a meeting to discuss the implementation of this work. Fansteel or Earth Sciences will be in contact with you within the next several weeks to schedule such a meeting.

Respectfully submitted,

John J. Hunter
Project Manager

JJH:ljm

Enclosures

cc: B. Driscoll (USEPA)
D. McHard (OSDH)
D. Dillon (OWRB)
T. Mo (NRC)